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Review

Scientific abstracts: Texts, contexts, and subtexts

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Abstract

In their 4000-year history, abstracts have taken several forms and represented a variety of documents. The scientific journal emerged in the 1600s and gave rise to what would become the modern scientific abstract. Here, I describe the contexts in which abstracts evolved, address the subtexts of opinions about their purpose, and review the texts of 12 kinds of abstracts. For most readers, articles do not exist beyond abstracts. However, the quality of abstracts is often poor. Inaccuracies are common, serious, widespread, and long-standing. Abstracts should inform only the choice of what to read and never what to do.

Keywords:

Abstracts of research papers, conference proceedings, scientific articles, scientific publication

Introduction

The abstract is a good idea. At least 4000 years old, and despite some differences in form, its function remains unchanged: to represent a larger document by describing or excerpting its contents. Here, I describe the contexts from which abstracts emerged, review the subtexts of opinions about what abstracts should do, and consider the characteristics of their texts, including their strengths and weaknesses. I offer advice on how to write abstracts—and how to read them.

The context: The evolution of the abstract

> "An abstract can be described as a summary of the information in a document accompanied by adequate bibliographic information to enable the document to be traced."
>
> Bernard Houghton, in *Scientific Periodicals*, 1975[1]

Early abstracts

Abstracts became necessary when the contents of the documents they represented were not easily remembered or identified. For example, in Mesopotamia in 2000 BCE, cuneiform texts, written on clay tablets, were sealed in clay envelopes for protection. The text no longer visible, its contents were indicated by an abstract printed on the envelope.[2] By CE 200, the Egyptians had added abstracts to the beginning of papyrus scrolls, which avoided the need to unroll scrolls, up to 20 meters long at times, to determine their contents.[3] Since then, various types of documents acquired their own form of abstracts, the terms for many of which survive today (Table 1).

Abstracts also became useful when not everyone had access to a source document. In the 1600s, this scarcity of access led to the development of scholarly communication networks, then to the scientific journal, and finally to the scientific abstract.

Table 1. Synonyms for 'abstract' illustrating how the concept has been conceptualized in various contexts

- An **abridgement**, from the Latin *ab* 'away from' + breviare 'shorten'; 'that which has been shortened'
- An **abstract**, from the Greek *ab*, or 'off' + '*trahere*' or 'to draw or pull'; hence 'to draw off from'
- A **breviary**, from the Latin *breviarium*; 'summary'; a short prayer book used by Catholic priests
- A **brief**, a 'letter or summary' from the Pope and thus a 'letter of authority'. Later, a 'summary of the facts of a case'; a legal brief
- A **condensation**, from the Latin *condensare* 'to make dense'
- A **digest**, from the Latin *digesta*, literally a 'digested thing'; to separate, divide, or arrange
- An **epitome**, from the Greek *epitemnein*, 'to cut short'; a summary of non-fiction works
- A **précis**, from the French 'to cut short'
- A **review**, from Latin *revidere*, from re- 'again' + *videre* 'to see'; 'to see again'; a 'general examination or criticism of a recent written work'
- A **summary**, from Medieval Latin *summaries*, 'pertaining to the sum or substance'
- A **synopsis**, from the Greek 'to see together' or 'overview'; 'to see all at once'

Scientific journals and abstracts

In the early 1600s, scientists and scholars throughout Europe had formed 'invisible colleges', or informal networks of members who traded correspondence and met to discuss the scientific issues of the day.[3] One such scholar was Henry Oldenburg, who was an 'intelligencer', a type of correspondent or journalist who collected, copied, and forwarded these 'learned letters' –summaries of observations and experiments – to key people in these networks.[4]

The invisible colleges began to organize into formal scientific associations in 1663 with the founding of the Royal Society of London for Improving Natural Knowledge. Not surprisingly, Oldenburg, the boundary-spanning intelligencer with contacts throughout Europe, helped found the Society. As its first secretary, he wrote abstracts of the papers after they were read aloud at the weekly meetings of the Society.[5] Shorter than the original paper, abstracts took up less space in the minute books, were quicker to read, and could be printed faster and less expensively. Thus, abstracts enabled rapid communication of research results.[6] This quality led to the origin of the scientific journal, which initially published summaries written by others, not by authors.[7] Not surprisingly, Henry Oldenburg was also on the forefront of this innovation.

Oldenburg founded the *Philosophical Transactions of the Royal Society of London* in 1665, the first and longest continuously published scientific journal.[7] (Technically, *Transactions* is the second oldest journal, the first being the *Journal de Scavans*, which was introduced 3 months earlier in France, although it published only summaries of other publications, not original research.[7] Perhaps not surprisingly, the founder of the *Journal*, Denis De Sallo, was also an intelligencer.[4]) From its beginnings, *Transactions* included abstracts and a form of peer review, although both practices would evolve.

The modern scientific abstract

In 1837, the Royal Society published *Abstracts of the Papers Printed in the Philosophical Transactions of the Royal Society of London*, which reprinted the abstracts it had published since 1800. In so doing, it began using 'abstract' in its modern meaning (although abstracts could be 5 or more pages, because the papers could be 40 or more pages).[5] *Abstracts* was eventually renamed the *Proceedings of the Royal Society*, making it an 'abstracting journal'.[3,5,6] Many such journals were published throughout the 1900s, including the well-known *Biological Abstracts* (1926 to the present), *Psychological Abstracts* (1926–2006), and *Chemical Abstracts* (1907–2009).

By the late 1800s, the *Proceedings* and *Transactions* had assumed different functions. In 1891, authors had to write their own abstracts and were required to submit them to the *Proceedings* (which published only abstracts) and to submit the accompanying manuscript to the *Transactions* (which published only full articles without abstracts).[6]

Innovations in abstracts

Perhaps the first innovation in abstracts since the 1660s was the 1914 effort by the Royal Society to standardize its form: "… every paper submitted to the Society must be accompanied by a summary not exceeding 300 words in length, showing the general scope of the communication, and indicating points which, in the opinion of the Author, are of special importance."[6]

This innovation was followed by a similar one in 1949, when the Society sponsored the *Guide for the Preparation of Synopses*, which established still more of the characteristics of the modern abstract.[6] (Why the Guide used 'synopses' instead of 'abstracts' is unknown.) From the *Guide*:

- "It is desirable that every paper appearing in a scientific journal be accompanied by a synopsis which should be independent of the text and figures and should preferably appear at the beginning of the paper; it is intended to convey briefly the contents of the paper, to draw attention

to all new information and to the main conclusions. It should be factual."

- "The synopsis should be subject to the same editorial scrutiny and correction as is usual for the full paper. Automatic acceptance of a synopsis written by an author is not desirable. … It should be presumed that the reader has some knowledge of the subject but has not read the paper."
- "It is impossible to recommend a standard length for a synopsis. It should, however, be concise and should not normally exceed 200 words."
- "It is preferable to use the third person to focus the reader's mind on the things of the laboratory and the natural world, rather than to draw attention to the text itself or its author." (However, first-person pronouns have been acceptable if not preferred in scientific publications since the early 1900s.)

A third innovation was the adoption of the IMRAD format (introduction, methods, results, and discussion).[7] The format was introduced in the early 1900s for reporting research but was slow to be adopted.[8] Its modified form (introduction, methods, results, and conclusions) was first used in abstracts in the 1940s. Not until the 1970s was the format established in both articles and abstracts, when it was adopted by the International Committee of Medical Journal Editors (ICMJE).[8]

A fourth innovation was the scientific poster, introduced in conferences of the natural sciences during the 1960s.[9] Posters could be accompanied by a lecture or by conversations with the authors, who would stand by their posters in a viewing room. Critically, posters are the only type of abstract that supports in-person networking. Many posters today are digital and displayed on monitors, as opposed to the traditional poster board.

A fifth innovation came from the need to more efficiently screen the medical literature for the practice of evidence-based medicine. The structured abstract for reporting clinical trials was introduced by Annals of Internal Medicine in 1987,[10,11] and the CONSORT extension for abstracts was released 20 years later.[12]

A sixth innovation has been the introduction of visual abstracts, such as the graphical abstract and video and animated abstracts.[13-15]

Thus, the production and publication of abstracts evolved in several stages. They were first written by others after publication of the article,[5,6] then before publication of the article,[5] and finally published instead of the article.[6] Eventually, they were written by authors and published with the article[6] and later, at the beginning of the article.[6]

The abstract has also changed its form to take advantage of new media. Originally written in narrative form, it now includes a more enumerative form (the structured abstract). Originally prepared exclusively as text, it can now include images (meeting abstracts). Originally prepared to be read, it now includes text and images to be 'viewed' (posters). Originally prepared in words, it now includes a form comprising only images (graphical abstracts). Originally prepared for print, it now includes a form presented as full-motion video to be watched or read online (digital meeting abstracts, videos, and animated abstracts).

As described below, the abstract continues to evolve to accommodate the features of new media. But different subtexts have also emerged, perhaps unconsciously, about its purpose(s) and therefore about its desired form and content.

The subtext: Opinions and expectations of abstracts

> "The ideal summary is more than a mere digest or shortened form of the paper. It differs from the paper itself in that it is addressed to a wider circle of readers which may include the experts but contains also many others who should, in fact, receive the principal attention. **For this reason, it may be more difficult to write than the paper itself...**" [Emphasis added]
>
> William H. Bragg, President of the Royal Society of London, 1938[16]

Approaches to writing abstracts

There are two approaches to writing abstracts. One is to focus on readers to help them 1) choose which articles to read,[3,17,18] 2) screen articles more quickly,[3,14,16,17] 3) decide whether to retrieve an article to read,[3] 4) plan to attend a lecture or view a poster at a conference,[19] 5) expect publication of the completed research,[3] or 6) become aware of the research.[3,7,21]

The other approach is to focus on the study and summarize the research, especially for readers who will not or cannot access the full article, either because it is physically unavailable or written in a different language.[6,18,21] In this case, the abstract substitutes for the full article.[21] This approach holds that abstracts should contain as many details as possible[12,22-24] (which does aid in indexing).[11,21]

The implications of these approaches are that reader-focused abstracts might include more details on the nature and extent of the problem and on the implications of the research, whereas study-focused abstracts might report more details of the methods and more data.[3]

Attempts to accommodate both approaches include the suggestion to have shorter, descriptive abstracts aid readers and to have longer, informative abstracts summarize the research.[21] A second, if unintentional, accommodation was to standardize the information reported, as in the structured abstract used in medicine (see below).[11]

In my opinion, the primary purpose of an abstract is to help readers choose what to read. What other decision could reasonably be based on an abstract, even a well written one? An abstract cannot establish the validity of the methods, confirm the soundness of the conclusions, communicate nuances or exceptions, or – critically – support informed decision-making. In fact, as described below, substantial proportions of abstracts are characterized by information that is misleading, missing, or inconsistent with the full article. These problems alone are common enough and serious enough to prevent them from justifying any decision other than whether to read the full text.

Expectations of abstracts

In recent years, some journals have added two headings to the structured abstract: limitations of the study and harms.[12,25-27] Certainly, this information needs to be in the article,[28] but would including it in the abstract make the article more attractive to readers? Would its absence make it less attractive?

The rationale for adding these headings is the concern that physicians might base treatment decisions only on the abstract, without appreciating the study's limitations or the treatment's potential for harm.[7,12,22,27,29] The concern is justified.[29,30] In fact, a large proportion of physicians worldwide can access only abstracts. Yet, all studies have limitations and the potential for harm, and

this information is also missing from many articles reporting clinical trials.[28] In addition, agreement among reviewers on the quality and relevance of abstracts is distressingly poor.[31] Finally, in an appalling proportion of abstracts, the information is missing, biased, or inconsistent with the full article. These problems are far more common and potentially just as serious as not reporting limitations or harms in the abstract. In my opinion, 'to prevent physicians from making mistakes' is neither the intended, nor a desirable, nor an achievable purpose of an abstract.

The text: Current forms of the abstract

> **"The present general unsuitability of authors' summaries for use as abstracts is recognised;** nevertheless, if these could be used it would increase the speed of publication and reduce the cost of journals publishing abstracts." [Emphasis added]
>
> Circular letter from the Royal Society to UK learned societies, 12 April 1949[6]

Types of abstracts

Abstracts have taken a surprising number of forms that differ in how much information they convey, what kind of information they convey, and how they convey it. (Wikis, blogs, social media, podcasts, and other digital media are capable of transmitting abstracts but are not addressed here.)

Descriptive (or indicative, limited, unstructured, or narrative) **abstracts** consist of a single paragraph, without internal headings, that describes the contents of the article, as opposed to reporting data or results. Typically 150 to 250 words long, descriptive abstracts are not recommended for articles reporting research, but they are often necessary for review articles that address several questions or summarize several topics.[1,3,11]

Informative (or informational, comprehensive, complete, or author) **abstracts**, the most common type, consist of a single paragraph of 200 to 350 words organized with an introduction, methods, results, and conclusion, although these headings may or may not appear in the body of the abstract. These abstracts provide details about the research, including results and conclusions.[1,3,11]

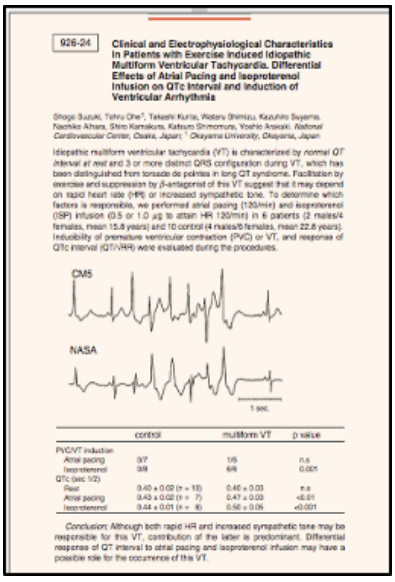
Structured abstracts, developed to help readers screen reports of clinical trials more efficiently, consist of five or more headings (the number and terms vary among journals), each representing a key aspect of a randomized trial or a prospective study.[11,12] Typical word limits are 200 to 350 words. Usually, only the results and conclusions require complete sentences (Table 2).

Table 2. The CONSORT Extension to Structured Abstracts.[12] The heading on harms was added to help prevent readers from basing treatment decisions only on the information in the abstract. (See text for discussion of this issue.) Many journals use different headings.

• Title	• Outcomes	• No. analysed
• Trial design	• Randomization	• Harms
• **METHODS**	• Blinding	• CONCLUSIONS
• Participants	• **RESULTS**	• Trial registration
• Interventions	• No. randomized	• Funding
• Objective	• Recruitment	

Meeting (or conference) **abstracts** differ from the above forms in that they usually have higher maximum word limits and can include tables, graphs, and images (Figure 1). More often published in a conference programme than in journals, meeting abstracts help readers decide whether to attend a lecture or view a poster, as opposed to reading an article.

Posters are similar to meeting abstracts in that they can include tables, graphs, and images



926-24

Clinical and Electrophysiological Characteristics In Patients with Exercise Induced Idiopathic Multiform Ventricular Tachycardia. Differential Effects of Atrial Pacing and Isoproterenol Infusion on QTc Interval and Induction of Ventricular Arrhythmia

Shoge Suzuki, Tohru Ohe[1], Takeshi Kurita, Wataru Shimizu, Kazuhiro Suyama, Naohiko Aihara, Shin Kamakura, Katsuro Shimomura, Yoshio Aoki. *National Cardiovascular Center, Osaka, Japan; [1] Okayama University, Okayama, Japan*

Idiopathic multiform ventricular tachycardia (VT) is characterized by normal QT interval at rest and 3 or more distinct QRS configuration during VT, which has been distinguished from torsade de pointes in long QT syndrome. Facilitation by exercise and suppression by β-antagonist of this VT suggest that it may depend on rapid heart rate (HR) or increased sympathetic tone. To determine which factors is responsible, we performed atrial pacing (120/min) and isoproterenol (ISP) infusion (0.5 or 1.0 μg to attain HR 120/min) in 6 patients (2 males/4 females, mean 15.8 years) and 10 control (4 males/6 females, mean 22.8 years). Inducibility of premature ventricular contraction (PVC) or VT, and response of QTc interval (QT/√RR) were evaluated during the procedures.

CM5

NASA

1 sec.

	control	multiform VT	p value
PVC/VT induction			
Atrial pacing	0/7	1/6	n.s
Isoproterenol	0/8	6/6	0.001
QTc (sec 1/2)			
Rest	0.40 ± 0.02 (n = 10)	0.46 ± 0.03	n.s
Atrial pacing	0.43 ± 0.02 (n = 7)	0.47 ± 0.03	<0.01
Isoproterenol	0.44 ± 0.01 (n = 8)	0.50 ± 0.06	<0.001

Conclusion: Although both rapid HR and increased sympathetic tone may be responsible for this VT, contribution of the latter is predominant. Differential response of QT interval to atrial pacing and isoproterenol infusion may have a possible role for the occurrence of this VT.

Figure 1. A meeting abstract published in a conference programme.*

*Such abstracts may include tables, graphs, and images. The number in the upper left corner is the number of the associated poster that was displayed at the conference. (Source: Suzuki S, Ohe T, Kurita T, et al. Clinical and electrophysiological characteristics in patients with exercise induced idiopathic multiform ventricular tachycardia. Differential effects of atrial pacing and isoproterenol infusion on QTc interval and induction of ventricular arrhythmia. J Am Coll Cardiol. 25 Feb.1995 [2_Supplement_1] 107A. Via Creative Commons CC BY-ND 2.0.)

and allow higher maximum word counts than those for printed abstracts. The poster is essentially an expanded abstract (ideally, fewer than 800 words[32] but often much longer, at the insistence of authors) presented in a different medium with more space (up to 120 × 90 cm). Whereas abstracts are read, posters are meant to be 'viewed' from 1 to 3 metres away (Figure 2).[32]

'**Promissory' abstracts** (a useful if not widely used term)[33] are meeting abstracts that report the interim results of a study, especially at conferences featuring state-of-the-art research. 'Promissory' refers to the expectation – more often than not, unmet – that the full results of the study will be published.[16,32,33]

Graphical abstracts draw attention to the article by summarizing a study in a drawing or diagram (Figure 3). One study found that adding graphical abstracts to tweets greatly increased visits to the article on the publisher's website,[15] but another found that graphical abstracts were viewed, downloaded, and cited less often than similar articles with conventional abstracts.[13]

Plain-language summaries, which generally avoid using technical terms, were introduced to make science more accessible to the public. In one study, these summaries and video abstracts were preferred to graphical abstracts and traditional scientific abstracts.[14]

Video and 2- and 3-dimensional animated abstracts were likely introduced in 2009.[34] These online abstracts, which average 2 to 5 minutes, feature authors talking about their research and are especially useful for demonstrating equipment, surgical techniques, and laboratory procedures. Most are low-budget videos made by researchers, although commercial vendors are available.

Ergonomic abstracts consisted of a series of nested tables. Proposed in the mid-1970s, they never caught on.[7,35,36] The abstract looks like a small poster in that it consists of a rectangle containing several other rectangles, each containing a specific kind of information, such as text, tables, graphs, or images.

Tabstracts, introduced by JAMA in 2015, were a variation of the structured abstract in which a numerically dense results section was replaced with a table that more clearly summarized the data. Limitations in displaying them online led to discontinuation. Only 47 were published (personal communication, Stacy Christiansen 20 Jan. 2022).

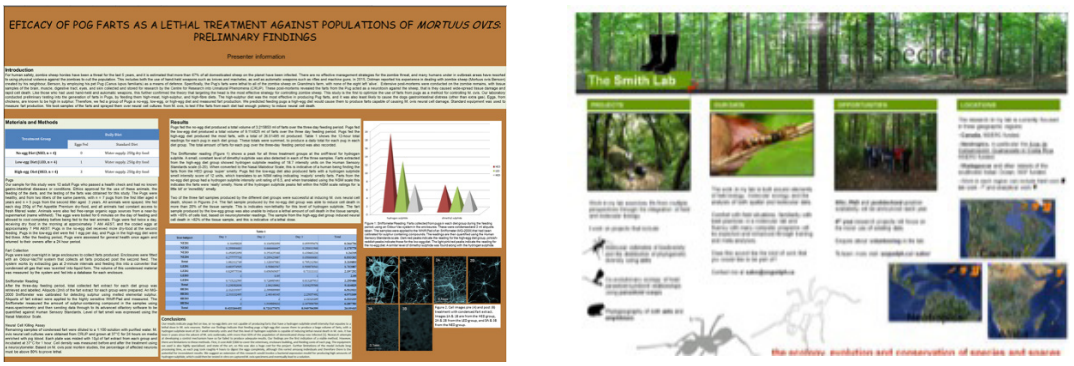


Figure 2. Scientific posters can present more information than other kinds of abstracts, but they are visual, so their effectiveness depends largely on good graphic design. Left panel: A poorly designed poster with too much text, long lines of type, justified paragraph margins, small type sizes, few illustrations, and little white space. Right panel: A well designed poster that is visually pleasing, presents only the main points of the research, and devotes more space to illustrations than to text. (Via Creative Commons CC BY-ND 2.0.).

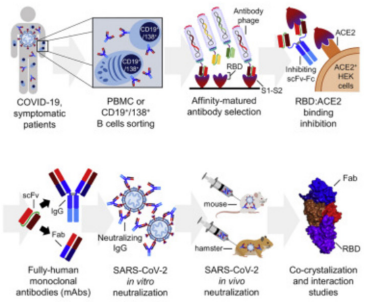


Figure 3. Graphical abstracts are intended to – and do – attract attention. Difficult to create, they may also be difficult to understand and therefore less often read. (Source: Bertoglio F, Fuhner V, Ruschig M, et al. A SARS-CoV-2 neutralizing antibody selected from COVID-19 patients binds to the ACE2-RBD interface and is tolerant to most known RBD mutations. 2021;36(4):109433. doi.org/10.1016/j.celrep.2021.109433 Via Creative Commons CC BY-ND 2.0.)

Figure 4. Cartoon abstracts and teaching materials are surprisingly effective in attracting attention and improving comprehension and interest in a topic. They are part of a new field called 'graphic medicine'. A major drawback is the space required to keep the images and text legible. (Source: Hapsari VD, Xiong S. Effects of high heeled shoes wearing experience and heel height on human standing balance and functional mobility. Ergonomics. 2016;59(2):249-64. doi: 10.1080/00140139.2015.1068956 Via Creative Commons CC BY-ND 2.0.)

Cartoon abstracts, introduced by Taylor & Francis publishers in 2015, appear to be surprisingly popular and effective in improving depth-of-read, comprehension, and retention in both the general public and clinicians (Figure 4).[37,38] They are part of a field called 'graphic medicine', in which medical and health information is presented as illustrations or cartoons.[39]

Problems with abstracts

As a group, abstracts are distressingly inadequate representations of their articles

and the associated research.[7,11] However, the shortcomings of abstracts described below usually cause problems only when an abstract is cited without reading the full article or is inappropriately used to inform, say, a treatment decision.

Problems with missing information

- In the abstracts of 198 randomized trials in periodontal care published by 57 journals, the sizes of experimental groups were almost never reported. Only 51% (101) identified the study as a randomized trial, 22% (44) reported the use of blinding, 14% (28) reported an effect size, 6% (12) confidence intervals, and 4% (8) reported the trial setting.[30]
- In 303 abstracts of cost-utility analyses, the intervention was reported in 94% (285), the comparator in 71% (215), the target population in 85% (258), and the study perspective in 28% (85). However, all four data elements were reported in only 20% (61), and three elements were reported in only 49% (148).[40]
- In the abstracts of 146 systematic reviews in periodontology, the direction of evidence was reported in only two-thirds, and the strength of evidence and confidence intervals were reported in fewer than half. Measures of heterogeneity, such as the I^2 statistic, were reported in only 7 abstracts.[41]
- In 112 abstracts from studies with unfounded inferences of equivalence in comparisons of diagnostic imaging performance, none identified the research as equivalence or non-inferiority studies, none specified the power of the study, and only 1 acknowledged small sample size as a limitation.[42]
- In the abstracts of 40 randomized trials of spinal surgery, the primary outcome was not clearly stated in 31, pertinent negative findings were reported in only 24, and relevant statistically significant results were missing in 16.[43]

Problems with misleading information: 'Spin'

'Spin' is reporting a desirable conclusion that is not supported by the data. It commonly occurs when authors claim that a treatment is beneficial, although improvement in the primary end point was not statistically significant.[44,45] Spin may be apparent when authors shift the discussion to more promising secondary endpoints, to any statistically significant results, or when a *P* value is described as 'trending toward significance'.[46] Unfortunately, spin is quite common in abstracts in all branches of medicine.[7]

- In the abstracts of 250 randomized trials in orthopaedic surgery with non-statistically significant results, spin was found in 45% (112). Of these 112, spin appeared in the results of 46% (52) and in the conclusions of 79% (89).[47]
- Of 116 randomized trials in psychiatry and psychology journals with non-statistically significant results, spin was found in 70% (81).[48]
- In the abstracts of 72 randomized trials reporting non-statistically significant results, spin was found in 96% (69). Spin was detected in the titles of 19% (13), in the results of 39% (27), and in the conclusions of 61% (42) of abstracts.[46]
- In 196 abstracts with non-statistically significant results randomly selected from meta-analyses published in five leading general medical journals, spin was found in 94% (184).[49]
- Among the abstracts of 114 randomized trials in emergency medicine with non-statistically significant results, spin was found in 44% (50).[50]

Problems with lost, missing, and inconsistent information: Meeting abstracts

In addition to missing data and spin, a large proportion of meeting abstracts are not followed by publication of the completed study. In addition, the information in the published article often differs from the data presented at the conference.[3,51]

- Of 19,123 abstracts presented at 234 biomedical meetings between 1957 and 1999, only 44% (8414) had been published in peer-reviewed journals within 6 years.[52]
- Among 200 meeting abstracts presented at the Brazilian Congress of Plastic Surgery in 2010 and 2011, only 25% (50) had been published by 2016, and 96% (48) of these had discrepancies: 46 in authorship, 26 in sample size, 18 in study designs, 10 in methods, 10 in results, 4 in conclusions, and 3 in purpose.[53]
- Of 2345 abstracts presented at five meetings of the International Liver Transplantation Society between 2004 and 2008, only 39% (913) were eventually published. Among the published articles, 50% were from the plenary sessions, 49% were from oral presentations, and 35% were from posters.[54]
- Of 770 meeting abstracts in orthopaedics and traumatology, only 29% (227) were followed by full publication. Discrepancies were found in 80% (182) of the published articles, in 44% of the 116 oral presentations, and in 22% of the 111 poster presentations.[55]
- Of 1045 abstracts accepted for the 2010, 2011, and 2012 North American Spine Society annual meetings, only 44% (460) were eventually published as full articles before or up to 3 years after presentation. Podium presentations were more likely to be published than poster presentations (47.1% vs 37.7%).[56]

Editorial caution signs

An abstract can indicate potential problems in a manuscript.

Circular reasoning. Sometimes authors report conclusions in the abstract that are the same as the study hypothesis. In the example below, there is no indication that the study did or found anything new.

> **Hypothesis:** Cardiac-signalling proteins sensitive to changes in cardiac status may help predict long-term cardiac effects of doxorubicin in children with acute lymphoblastic leukaemia.
>
> **Conclusions:** Cardiac-signalling proteins may help identify children with acute lymphoblastic leukaemia at greatest risk of the long-term, adverse cardiac effects of doxorubicin.

Desperate reasoning. Sometimes authors study something that can be studied rather than something that needs to be studied. The result is often a poor purpose statement.

> "The relationship between academic achievement and dancing ability is not well-described." (Why does it need to be described?)
>
> "Homeopathy has been studied elsewhere but similar studies have not been done here." (Why does it need to be done here?)
>
> "Little is known about how the titles of research articles have changed in length over time." (I call these 'LIKA studies' — 'little is known about' — therefore we had to study it. Maybe not.)

Poor writing. Below, the original statement was not impressive. However, editing revealed that the study was actually quite important.

> **Original:** "Little is known about the outcomes in preterm infants with heart defects and the factors associated with surgery and survival."
>
> **Revised:** "The consequences of offering either corrective or palliative surgery to preterm infants with heart disease are largely unknown. This study will help inform these decisions."

Unfocused purpose statements. The purpose of research is never 'to study', which is a non-specific action that says what or how something was done but does not imply an outcome (we already know the researchers studied something).[32] In contrast, 'to determine' tells why the research was done and does imply an outcome (whether something was determined or not). Below, every term in the left column can be paired with one in the right, forming the basis for a good purpose statement.

Why the study was done	***What or how the study done***
To determine . . .	. . . we compared
To verify . . .	. . . we tested
To describe . . .	. . . we observed
To select . . .	. . . we evaluated

Conclusions

The title and abstract are the most important parts of an article: the parts most often read and often the only parts read.[11,32] They are the only parts readers see when screening the literature, the only parts not hidden behind paywalls, the only parts in the initial invitation to prospective reviewers (who can then decide to link to the full manuscript), and the only parts published in conference proceedings. In fact, for almost all readers, the article does not exist beyond its title and abstract.[23] Inaccuracies in abstracts are common, serious, widespread, and long-standing. Such abstracts are often clearly deficient – and even dangerous – when assumed to be accurate and actionable summaries of the research. Abstracts should inform only the choice of what to read and never what to do.

References

1. Houghton B. *Scientific Periodicals: Their Historical Development, Characteristics, and Control*. Hamden, CT: Linnet Books, 1975.

2. Witty F. The beginnings of indexing and abstracting: some notes towards a history of indexing and abstracting in antiquity and the Middle Ages. *Indexer*. 1973;8(4):193–198.

3. Kronick D. *The Literature of the Life Sciences*. Philadelphia, PA: ISI Press, 1985.

4. Harmon K. A theory set in stone: an asteroid killed the dinosaurs, after all. *Sci Am*. March 4. https://www.scientificamerican.com/article/asteroid-killed-dinosaurs/.

5. Yuen Y. What's so abstract about scientific abstracts? *Inside Science*. 29 Jul 2020. https://www.insidescience.org/news/whats-so-abstract-about-scientific-abstracts (cited 28 March 2022).

6. Fyfe A. Where did the practice of 'abstracts' come from? *The History of the Scientific Journal. The Economic, Social and Cultural History of the World's Oldest Scientific Journal, 1665-2015*. https://arts.st-andrews.ac.uk/philosophicaltransactions/where-did-the-practice-of-abstracts-come-from (cited 26 March 2022).

7. Bastian H. Science in the abstract: don't judge a study by its cover. 2014 May 12. https://blogs.scientificamerican.com/absolutely-maybe/science-in-the-abstract-don-t-judge-a-study-by-its-cover/

8. Sollaci L, Pereira M. The introduction, methods, results, and discussion (IMRAD) structure: a fifty-year survey. *J Med Libr Assoc*. 2004;92(3):364–367.
9. Qin J. Information dissemination in academia. https://scalar.usc.edu/works/informationisfree/historyofposter
10. Huth E. Structured abstracts for papers reporting clinical trials. *Ann Intern Med*. 1987;106(4):262–267.
11. Zhang C, Liu X. Review of James Hartley's research on structured abstracts. *J Inform Sci*. 2011;37(6):570–576.
12. Hopewell S, Clarke M, Moher D, CONSORT Group. CONSORT for reporting randomized controlled trials in journal and conference abstracts: explanation and elaboration. *PLoS Med*. 2008;5(1):e20.
13. Pferschy-Wenzig EM, Pferschy U, Wang D. Does a graphical abstract bring more visibility to your paper? *Molecules*. 2016;21(9):1247.
14. Bredbenner K, Simon S. Video abstracts and plain language summaries are more effective than graphical abstracts and published abstracts. *PLoS One*. 2019;19(11):e0224697.
15. Ibrahim A, Lillemoe K, Klingensmith M, et al. Visual abstracts to disseminate research on social media: a prospective, case-control crossover study. *Ann Surg*. 2017;266(6):e46–48.
16. Bragg W. Address of the President Sir William Bragg, O.M., at the Anniversary Meeting, 30 Nov. – 6 Dec. 1938. https://royalsocietypublishing.org/doi/epdf/10.1098/rspa.1938.0192
17. Weil B, Zarember I, Owen H. Technical-abstracting fundamentals. I. Introduction. *J Chem*. 1963;3(2):86–89.
18. International Conference of Medical Science. The scientific abstract and its importance. 1 Dec. 2020. https://icmsbg.org/the-scientific-abstract-and-its-importance/
19. McGenity C, Bossuyt P, Treanor D. Reporting of artificial intelligence diagnostic accuracy studies in pathology abstracts: compliance with STARD for abstracts guidelines. *J Pathol Informat*. 13;2022;100091.
20. Haynes R, Mulrow C, Huth E, et al. More informative abstracts revisited. *Ann Intern Med*. 1990;113(1):69–76.
21. Gray D. Abstracts. Phys Today. 1949;2(3):20.
22. Einarson T, Lee C, Smith R, et al. Quality and content of abstracts in papers reporting about drug exposures during pregnancy. *Birth Defects Res A Clin Mol Teratol*. 2006;76(8):621–628.
23. Andrade C. How to write a good abstract for a scientific paper or conference presentation. *Indian J Psychiatry*. 2011;53(2):172–175.
24. Helmenstine A. How to write an abstract for a scientific paper. ThoughtCo. 2021. thoughtco.com/writing-an-abstract-for-a-scientific-paper-609106
25. Bernal-Delgado E, Fisher E. Abstracts in high profile journals often fail to report harm. *BMC Med Res Methodol*. 2008;8:14.
26. Can O, Yilmaz A, Hasdogan M, et al. Has the quality of abstracts for randomised controlled trials improved since the release of Consolidated Standards of Reporting Trial guideline for abstract reporting? A survey of four high-profile anaesthesia journals. *Eur J Anaesthesiol*. 2011;28(7):485–492.
27. Tsou A, Treadwell J. Quality and clarity in systematic review abstracts: an empirical study. *Res Synth Methods*. 2016;7(4):447–458.
28. Ioannidis J, Evans S, Gøtzsche P, et al., CONSORT Group. Better reporting of harms in randomized trials: an extension of the CONSORT statement. *Ann Intern Med*. 2004;141(10):781–788.
29. The PLoS Medicine Editors. The impact of open access upon public health. *PLoS Med*. 2006;3(5):e252.
30. Kumar S, Mohammad H, Vora H, et al. Reporting quality of randomized controlled trials of periodontal diseases in journal abstracts-a cross-sectional survey and bibliometric analysis. *J Evid Based Dent Pract*. 2018;18(2):130-141.e22.
31. Rubin H, Redelmeier D, Wu A, et al. How reliable is peer review of scientific abstracts? Looking back at the 1991 Annual Meeting of the Society of General Internal Medicine. *J Gen Intern Med*. 1993;8(5):255–258.

32. Lang T. *How to Write, Publish, and Present in the Health Sciences: A Guide for Physicians and Laboratory Researchers*. Philadelphia, PA: American College of Physicians, 2009.
33. Hairston M. Abstracts. University of Minnesota Duluth. https://www.d.umn.edu/cla/faculty/troufs/comp3160/Hairston.abstracts.html#writing_promissory
34. Berkowitz J. Video abstracts, the latest trend in scientific publishing. University Affairs/affaires universitaires. 2013. https://www.universityaffairs.ca/features/feature-article/video-abstracts-the-latest-trend-in-scientific-publishing/ (cited 12 April 2022).
35. Ertl N. A new way of documenting scientific data from medical publications. *Karger Gazette*. 1969;20(27):1–3.
36. Hortolà P. An ergonomic format for short reporting in scientific journals using nested tables and the Deming's cycle. *J Info Sci*. 2007;34(2):207–212.
37. Lin SF, Lin H, Lee L. Are science comics a good medium for science communication? the case for public learning of nanotechnology. *Int J Sci Ed Part B*. 2015;5(3):276–294.
38. Junhasavasdikul D, Sukhato K, Srisangkaew S, et al. Cartoon versus traditional self-study handouts for medical students: CARTOON randomized trial. *Med Teacher*. 2017;39(8):836–843.
39. King A. Using comics to communicate about health: an introduction to the symposium on visual narratives and graphic medicine. *Health Commun*. 2017;32(5):523–524.
40. Rosen A, Greenberg D, Stone P, et al. Quality of abstracts of papers reporting original cost-effectiveness analyses. *Med Decis Making*. 2005;25(4):424–428.
41. Faggion CJ, Liu J, Huda F, et al. Assessment of the quality of reporting in abstracts of systematic reviews with meta-analyses in periodontology and implant dentistry. *J Periodontal Res*. 2014;49(2):137–142.
42. May L, Guillerman R, Zhang W, et al. Unfounded conclusions of equivalence in diagnostic accuracy studies: a pervasive fallacy of inference in pediatric radiology scientific abstracts. *Pediatr Radiol*. 2018;48(13):1861–1866.
43. Lehmen J, Deering R, Simpson A. Inconsistencies between abstracts and manuscripts in published studies about lumbar spine surgery. *Spine*. 2014;39(10):841–845.
44. Hemming K, Javid I, Taljaard M. A review of high impact journals found that misinterpretation of non-statistically significant results from randomized trials was common. *J Clin Epidemiol*. 2022;145:112–120.
45. Chu K, Grundy Q, Bero L. "Spin" in published biomedical literature: a methodological systematic review. *PLoS Biol*. 2017;15(9):e2002173.
46. Boutron I, Dutton S, Ravaud P, et al. Reporting and interpretation of randomized controlled trials with statistically nonsignificant results for primary outcomes. *JAMA*. 2010;303(20):2058–2064.
47. Arthur W, Zaaza Z, Checketts J, et al. Analyzing spin in abstracts of orthopaedic randomized controlled trials with statistically insignificant primary endpoints. *Arthroscopy*. 2020;16:1443–1450.
48. Newman T. Investigating 'spin' in scientific journals. *Med News Today*. 10 Aug. 2019. https://www.medicalnewstoday.com/articles/325952
49. Nascimento D. Letter to the Editor - Not even the top general medical journals are free of spin: A wake-up call based on an overview of reviews. *J Clin Epidemiol*. 2021;139:232-234.
50. Reynolds-Vaughn V, Riddle J, Brown J, et al. Evaluation of spin in the abstracts of emergency medicine randomized controlled trials. *Ann Emerg Med*. 2019;14:423–431.
51. Callaham M, Wears R, Weber E, et al. Positive-outcome bias and other limitations in the outcome of research abstracts submitted to a scientific meeting. *JAMA*. 1998;280(3):254–257.

52. von Elm E, Costanza M, Walder B, et al. More insight into the fate of biomedical meeting abstracts: a systematic review. *BMC Med Res Methodol*. 2003;10(3):12.

53. Denadai R, Araujo G, Pinho A, et al. Discrepancies between plastic surgery meeting abstracts and subsequent full-length manuscript publications. *Aesthetic Plast Surg*. 2016;40(5):778–784.

54. Hackett P, Guirguis M, Sakai N. Fate of abstracts presented at the 2004-2008 International Liver Transplantation Society meetings. *Liver Transpl*. 2014;20(3):355–360.

55. Yalçınkaya M, Bagatur E. Fate of abstracts presented at a National Turkish Orthopedics and Traumatology Congress: publication rates and consistency of abstracts compared with their subsequent full-text publications. *Acta Orthop Traumatol Turc*. 2013;47(4):223–230.

56. Narain A, Hijji F, Kudaravalli K. Publication rates of abstracts accepted to the 2010-2012 annual meetings of the North American Spine Society. *Spine*. 1976;42(22):1723–1729.

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